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ABSTRACT

Research has identified mentoring as a critical factor in the entry and survival of women and minorities in the social, natural, and physical sciences where they are underrepresented. Much research and many change-oriented programs in higher education have assumed that the presence of mentors is sufficient to ensure equitable access to scientific careers for women and minorities. Few research studies have explored in depth the processes involved in mentoring relationships for women and men, the effectiveness of these relationships from the perspective of proteges, the relationship of mentoring experiences to career productivity, or the links between one's experience as a protege and later mentoring activities as a senior scholar. This study addresses these issues using questionnaire data gathered from a nationally representative sample (N=400) of female and male scholars in three disciplines--sociology, chemistry and biochemistry, and physics and astronomy. Overall, analyses of the data implies that women and men appear to do equally well in terms of productivity over the career cycle. Although women have slightly less effective relationships with mentors, collaborate with them, and work less with eminent mentors in some disciplines, these factors do not appear to handicap them in long-term productivity. However, several cautions are raised about the findings, which are suggested as issues that require further study. (Contains 37 references and 7 tables of statistical data.) (DB)

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Mentoring, Gender, and Publication among Social, Natural, and Physical Scientists

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Introduction

Mentoring has been identified as a critical factor in entry and survival of women and minorities in social, natural, and physical sciences where they are underrepresented. Having an effective mentor aids completion of degree, receipt of funding for research and publication of scholarly research, all essential for academic career growth in these disciplines (Blackburn 1981; DuBois et al. 1985; Fox 1983, 1989; Hornig 1987; McGinnis and Long 1988; Ramaley 1978; Zuckerman 1990).

Mentors can provide instrumental resources and emotional support for beginning scholars, but research suggests that women scholars may have a more difficult time finding appropriate mentors, may collaborate less with mentors than women do, may join mentoring teams later in their careers, and may be more apt than males to encounter negative, exploitative forms of mentoring more often than do their male counterparts (CEEWSE 1983; Collins 1983; Long 1987, 1990; Menges and Exum 1983; Task Force 1988; Vetter 1988). Minority scholars might have special problems finding effective mentors (Brewer 1988; Collins and Matyas 1985; Kahle 1986; Malcolm et al. 1979; Mirande 1988; Rosser 1990.)

Much research and many change-oriented programs in higher education have assumed that the presence of mentors is sufficient to ensure equitable access to scientific careers for women and minorities. Few research studies have explored in depth the processes involved in mentoring relationships for women and men, the effectiveness of these relationships from the perspectives of proteges, the relationship of mentoring experience to career productivity, or links between one's experience as a protege and later mentoring activities as a senior scholar. This study addresses these issues, using questionnaire data from a nationally representative sample of women and men scholars in three disciplines--sociology, chemistry and biochemistry, and physics and astronomy.

Sample and Methods

To explore the issues outlined above, the investigators designed and pretested an extensive self-administered questionnaire asking about education and training, access to mentors in graduate school, quality of mentoring relationship, career productivity (published books, papers, chapters; funded grants; lectures, consultantships, and honorific awards), collaboration patterns, and mentoring of students or more-junior scholars. Questionnaires for chemists and physicists were identical. Those for sociologists included two questions about perceived acceptance of research focused on gender as opposed to other topics and perceived evaluation of qualitative as compared with quantitative research, which are relevant in that discipline. (See Appendix A for copies of questionnaires.)

Questionnaires were mailed to a random sample, stratified by gender, of 200 men and 200 women in academia in each of the following disciplines: sociology, chemistry and biochemistry, and physics and astronomy. These fields vary in proportions of women in academic departments, with women constituting about 35% of faculty in sociology, about 10-12% in chemistry and biochemistry, and about 2-4% in physics. All were scholars teaching in tenured or tenure-track positions in U.S. universities with Ph.D.-granting programs in their disciplines. For ethical reasons, scholars in all disciplines from the two universities where the investigators were employed, University of Georgia and Southern Illinois University at Carbondale, were omitted. Sample were drawn from current disciplinary guidebooks using a two-staged sampling procedure. Guidebooks used were the Guide to Graduate Programs, published annually by the American Sociological Association, the ACS Directory of Graduate Research, published by the American Chemical Society, and Graduate Programs in Physics, Astronomy, and

Related Fields, published by the American Institute of Physics. Editions of these guides from 1990 were used. Only scholars listed in the chemistry and biochemistry sections of the ACS guide were sampled, with faculty in chemical engineering departments excluded. Since women in physics and astronomy were so few, cooperation was obtained from the Committee on the Status of Women of the American Physical Society, which, after reviewing the questionnaire and approving the work, provided from its records a sample of women physicists and astronomers from its records. Male physicists and astronomers were selected randomly from the association directory, in the same manner as were sociologists and chemists.

Questionnaires were mailed via bulk mail with a cover letter explaining goals of the research, insuring potential participants that the research had been approved by the University of Georgia Institutional Review Board, and promising confidentiality. Questionnaires to women physicists/astronomers were also accompanied by a letter from Professor Mildred Dresselhaus, Chair of the Committee on the Status of Women in Physics (See Appendix B). Questionnaires, mailed in Winter 1991, were followed up three weeks later by reminder/thank you postcards and four months later by a re-mailing of questionnaires to nonrespondents. In the 30 cases where there were clear indications that the intended respondent was deceased, severly disabled, or otherwise failed to meet selection criteria (e.g., was now retired, no longer working in the U.S.), replacements were made. One questionnaire, returned by a male sociologist, was unusable because of repeated nonserious responses and thus is not included in the database.

These procedures yielded a response rate of 584, or 49 percent. Most nonrespondents were passive refusals, with fewer than 4 percent of contacted scientists actively declining participation. Overall response rates were highest

in sociology and lowest in chemistry (See Table 1). In all disciplines, response rates for women were higher than those of men, perhaps denoting greater centrality of the issues covered by the questionnaire for women than men. Preliminary analyses reveal few systematic differences between respondents and nonrespondents in locale, career history, or career stage, except that professionally younger male physicists (in terms of year of receipt of degree) are slightly underrepresented, relative to other groups. There were slightly less than 5 percent ethnic minority respondents among the sample, consistent with representation of minority-group members in these types of positions in these disciplines. A supplementary study by Kathryn Ward, discussed below, concentrates on women and minority scientists and provides more in-depth data on minority scholars' experiences.

Among respondents, as among academics in these disciplines, men in each field were more senior in rank than the women overall. In all disciplines, a majority of men were tenured while a majority of women were not. Men were of significantly greater professional age than women in all disciplines, having received degrees, on the average, five years earlier in sociology, seven years earlier in chemistry, and 11 years earlier in physics and astronomy.

The majority of scientists in all disciplines were currently married or had been married. There was a significant gender difference in marital history for physicists and astronomers (91.4% of men had been married as compared with 74.1% of women), but not in chemistry (87.5% men compared with 85.3% women) or sociology (89.4% men compared with 81.6%). In all disciplines, however, women were less likely to have had natural, adopted, or stepchildren who had lived with them compared with male counterparts. In physics and astronomy, 77 percent of men but only 49 percent of women had children. In chemistry, 78 percent of men but

only 60 percent of women had children. In sociology, 80 percent of male but only 53 percent of female scientists were parents.

Questionnaires contained both quantifiable data and open-ended responses. With the assistance of graduate student researchers, quantifiable items were coded and prepared for statistical analysis. These assistants also helped to prepare verbatim, computerized transcripts of all responses to open-ended items, which were analyzed both manually and with the assistance of text-analysis programs. Central hypotheses were addressed using both quantitative and qualitative data.

Effectiveness of Mentors

A first set of questions probed the effectiveness of mentoring that women and men scholars received at various points in their careers, testing hypotheses that women would find fewer mentors than men and would find their mentors to be less effective than was the case for male counterparts.

Scholars were asked to rate the effectiveness of their doctoral advisers and postdoctoral supervisors, respectively, as mentors for them on a four point scale with responses of 4=very effective; 3=moderately effective; 2=somewhat effective; and 1=not very effective. Numerical ratings were followed by open-ended items asking participants to comment on advantages and disadvantages of their adviser and postodoctoral supervisor as mentors for them.

Table 2 shows ratings of advisers and the first postdoctoral supervisors. Across disciplines women and men tended to give moderately high ratings to doctoral advisers. Only ratings assigned by women physicists and astronomers averaged below the "moderately effective" point on the scale. Thus, the majority of respondents had been well mentored by doctoral advisers. This finding is not surprising, since the sample included only those scientists successful enough to

have obtained a tenured or tenure track position in a doctoral-granting U.S. department.

As Table 2 shows, only among physicists and astronomers was there a significant gender difference in ratings of effectiveness of doctoral advisers, with women in these disciplines rating their advisers as less effective than their male counterparts did. Although women chemists' ratings were lower than those of male chemists, these differences are not significant. In sociology, males' and females' ratings of advisers were nearly identical.

In physics and chemistry, the overwhelming majority of doctoral advisers had been male (98% and 94%, respectively), so it was not possible for these disciplines to examine effects of interrelationships of gender of adviser and gender of mentee. However, in sociology there were sufficient numbers of scholars with female doctoral advisers to make such comparisons possible. Of the sociologists, 22 (or nearly 10% overall, 18 women and 4 men) had had female doctoral advisers, so such comparisons were possible. Among sociologists, females with female advisers gave them the highest rankings (3.2). The next highest rating was given to male advisers by male scholars (3.0), followed by a mean rating of 2.8 for female scholars with male advisers and 1.8 for male scholars with female advisers.

Only the latter rating represents a statistically significant difference from others and is a finding that must be interpreted in context. Only four males had had female advisers. Three had acquired their adivsers late in their doctoral work after disputes with other advisers or after previous advisers had left the departments where the students were enrolled. Further, in all but one case the female adviser was an assistant professor. In these cases the female advisers' junior status appeared to be confounded with her mentoring activities, with

proteges complaining in followup questions that their advisers were unknowledgeable about departmental procedures, had little power in departmental politics, or lacked access to extensive professional networks that could benefit proteges when seeking jobs or postdoctoral appointments. The single male respondent who had worked with a woman full professor, chosen because of common interests, rated her as a very effective mentor.

Ratings of Postdoctoral Advisers

Ratings of the first postdoctoral advisers shown in Table 2 are based on a smaller case base than are ratings of doctoral advisers. Although greater than 85 percent of physicsts and chemists had completed at least one postdoctoral assignment--a normative pattern in these disciplines--fewer than 15 percent of sociologists had done so. Chemists were more likely than others to have completed more than one postdoctoral position. In each discipline, there were no statistically significant differences in the proportions of women and men who had taken postdoctoral positions. Ratings in Table 2 of effectiveness are for the first postdoctoral supervisor.

Table 2 shows that postdoctoral advisers tended to be rated as less effective mentors than doctoral advisers by physicsts and astronomers and by sociologists, but chemists rated their first postdoctoral advisers as more effective than their doctoral advisers had been. (These patterns are the same as are shown in Table 2 when comparison are limited to only to those scholars who completed postdoctoral assignments.) There are also no gender differences in ratings of effectiveness of first postdoctoral adviser in any discipline. Open-ended followups suggested greater variation in the structure of postdoctoral positions than of doctoral work. While some scholars had close, personal relationships with postdoctoral advisers involving frequent communication and

collaboration, others rarely saw their supervisors or worked more closely with other research team members than with the formal supervisor of the assignment.

Access to Eminent Mentors

Women reported more difficulty in finding a mentor than did men, and 7 reported being explicitly turned down by males who refused or disliked to work with women. Apparently, these decisions by the potential mentor were not challenged. One woman speculated that highly eminent mentors were more apt than others to refuse to work with women, and to have this decision accepted by peers and supervisors. Other work has suggested that women less often have access to particularly eminent mentors, a substantial disadvantage since these relationships are apt to be the most beneficial in terms of productivity, initial job placement, and professional visibility (Cole 1987; Zuckerman 1987).

Scientists were asked scientists if their doctoral advisers or postdoctoral supervisors had been Nobel Laureates and/or members of the National Academy of Science. The item proved to be useful only for physicists and chemists, since no sociologists reported working with Nobel Laureates and only one (a male) reported working with a NAS member. No significant differences by gender appeared in chemistry for either doctoral or postdoctoral advisers. However, in physics and astrophysics, men were significantly more likely than women to have worked with a Nobel Laureate as a doctoral adviser (chi-square=7.72, $p<.03$) or a postdoctoral supervisor (chi-square=6.79, $p<.01$). However, the numbers are small in absolute terms, with only 8 scholars (6 men and 2 women) working with Nobel Laureates as doctoral advisers and only 6 (5 men and 1 woman) as postdoctoral supervisors.

Advantages and Disadvantages of Mentors

In open-ended followups probing advantages and disadvantages of doctoral advisers and postdoctoral supervisors as mentors, scholars in all disciplines

mentioned several themes that might be thought of as gender neutral, or mentioned as frequently by women and by men. Other themes were gender-specific, or mentioned more frequently or exclusively by persons of one gender. Most of the latter were themes raised by women. Although a few themes were more prevalent in one discipline than in others (e.g., access to high technology laboratories, which more relevant for physicsts and chemists than for sociologists) there were greater similarities than differences across disciplines in assessments of advantages and disadvantages of these mentors.

Participants' comments about positives and negatives of mentors are quoted at some length, since they provide insights into the dynamics of successful and unsuccessful mentoring relationships that likely are applicable in many settings.

Gender-Neutral Themes

In all disciplines women and men valued advisers and supervisors who displayed a combination of fine scientific ability. They praised scholars who were supportive, critical, up to date in their areas, enthusiastic about their work and that of their students and postdoctoral associates, available and attentive to their proteges' work, and concerned about students and junior scholars as people as well as scientists in training.

Descriptions given by women and men of such advisers and supervisors were very similar, and effective male and female advisers were described as having similar characteristics. The following excerpts illustrate:

> A talented and inspiring scientist who always had time for his students. An infectious enthusiasm for my work, even though it was different from the main focus of his. Always available to discuss ideas and give guidance. A fine human being who made me feel valued as a person.
>
> (Female chemist, male doctoral adviser)

* * *

Insightful, daring, technically spectacular. Well regarded by students and by national and international peers, yet a fully decent person with a life outside of the laboratory. A superb role model. A gifted teacher. (Male physicist, male postdoctoral supervisor)

* * *

Had faith in me. Convinced me that I could do chemistry. Had a good deal of confidence in me during the three years I worked in his laboratory. (Female chemist, male doctoral adviser)

* * *

A careful, meticulous scientist. Allowed independence in my work, but made critical, but encouraging appraisals. Made it clear that she cared about my professional development.
(Female physicist, female adviser)

Women and men also valued advisers and supervisors who prepared them well for their future as researchers and provided professional socialization, as in the following description:

Had weekly group meetings on research project. He made a point to designate a major porton of the research as an area where I would have primary responsibility. General socialization into the profession--grant proposals, journal submissions, revise and resubmits. Not a prima donna or deluded by notions of genius. Communicated pragmatism and craftspersonship.
(Female sociologist, male doctoral adviser)

Similar themes are raised by other respondents:

> Despite his immense international reputation, he was accessible, easy to work with, ready to pitch in, roll up his sleeves, solve a problem, go out for a beer in celebration of successes. He always praised students and associates, always took the opportunity .... to make their work known in his networks. Very generous in allocating me credit for our collaborative work.
>
> (Male physicist, male postdoctoral adviser)

* * *

> Even though her career was in high gear, she always found time for me. Carefully guided my work (yet respected my ideas). Her efforts led directly to three early publications, very helpful in the job hunt. Always had tremendous faith in my abilities.
>
> (Female sociologist, female doctoral adviser)

* * *

> Very professional. Excited about my projects, although the group focus at the time was in another area. Always available when I needed him. Always pushed me to make a paper or publication very solid. As my work progressed, began to treat me more as a colleague than an assistant. Never missed an opportunity to promote my career. Very helpful on the job market.
>
> (Female chemist, male doctoral adviser)

The combination of strong scientific and interpersonal skills appeared in both women's and men's descriptions of successful advisers. Further, many who had experienced more successful postdoctoral than doctoral advising relationships noted that when selecting a postdoctoral supervisor, they had searched explicitly

for someone who had ineterpersonal skills along with scientific abilities. One women chemist who had made such a search commented:

> Scientific skill without communicative ability is largely wasted, at least in the role as a teacher. Hostile treatment of students is NOT the best way to encourage them to do high-quality work. I had to learn that the hard way that the environmnent in which I worked was very important and that I could not respect a rude and abusive person, no matter how brilliant a scientist he was.

A woman physicist commented that in graduate school she held a largely-unconscious belief that good scientific skills and good interpersonal skills were incompatible. By the time she searched for a postdoctoral position, however, she realized that "....this is really a four-celled table with a good scientist/decent person cell.....I searched for a postdoc supervisor who fell into this category. I did my homework carefully!"

Certain disadvantages of relationships with mentors were equally prevalent among women and men. Scholars recalled problems working with advisers or postdoctoral supervisors who were inattentive to students' or associates' work, exploitative and unwilling to give fair credit for work, poor scientists and/or administrators, inaccessible due to overwork and/or frequent travel, too junior to have power inside or outside their departments, and unwilling or unable to support the junior scholar on the job market.

A woman chemist who rated her postdoctoral supervisor as not very effective noted as follows:

> He did not challenge my abilities or engage me in problem-solving. Instead, I was assigned routine tasks below my ability and experience. Scientifically, his lab was "sloppy" compared with compared to [some she

had worked in previously]. He was more interested in the "glitz" than in chemistry.

A male sociologist, displeased with his female adviser, attributed most problems to her heavy workload and junior status:

> I really didn't have a mentor who helped at all. Each one left before I finished. I used an assistant professor who would let me through easily. She was preoccupied with her own work and learning to teach. She had no extra-university contacts or networks. The biggest advantage was that she didn't do anything to keep me from finishing.

His comments were echoed by a woman physicist who had worked with a male assistant professor, who commented that although her adviser had been kind and supportive that "He was not taken very seriously [in the department]. I was his first doctoral student and he eas very 'green'about the process and still learning the ropes."

A male physicists described a male doctoral adviser whom he had ranked as a not very effective mentor as follows:

> Aloof. Didn't care about my work and wouldn't discuss research beyond his narrow specialty. No help on the job market. Seemed to resent answering questions. A poor administrator. His poor leadership caused grief, anxiety, extra work for [students and postdoctoral associates].

As with discussion of the strong points of good mentors, respondents' assessments of their formal mentors' weaknesses as mentors for them combined professional and personal qualities.

Gender-Specific Themes

Some assessments of advantages or disadvantages of mentors were gender-skewed. Although the themes appeared in assessments of women and men advisers and

supervisors by women and men junior scholars, they appeared more often in assessments of advisers of one gender more so than the other. Junior scholars were more likely to identify same-gender mentors as good role models, consistent with Epstein's (1970) argument that mentors and role models can be differentiated. Mentors, who may have any race or gender characteristics, support and encourage the work of a junior scholar and impart knowledge and encouragement supportive of achievement. Role models can do more by illustrating the openness of the system to persons of the aspirants' gender or race and by providing experientially-based advice on how to handle situations unique to persons of certain status configurations (e.g., sexual harassment, or subtle forms of racism). The designation "role model" was, with only two exceptions, mentioned only in discussion of a same-gender adviser or postdoctoral supervisor. Furthermore, women scholars as well as minority men, mentioned prominent individuals of their same status-configurations within their disciplines who had served as role models for them, even though they never established a mentoring relationship with them.

Both women and men valued advisers or postdoctoral supervisors who became friends as well as colleagues, but this theme was listed as an advantage of a relationship with a mentor more often by women than by men. Women valued both women and men mentors who were also friends. The following is a particularly striking example:

> It was a close friendship as well as a working relationship. We discussed ideas, professional opportunities, husbands, children, teaching, world issues, etc. We laughed together, we cried together, we were joyous about each other's professional achievements and distraught at each other's setbacks. I was an "older" student, very close to her age, and there were

similar things about our [personal] lives. I don't know how much this contributed to the closeness. She still supports me personally and professionally, even though I've been out of graduate school nearly a decade. We talk on the phone a lot, because we are on opposite sides of the country and don't see each other much. We talk about EVERYTHING.

(Female sociologist, female adviser)

The following excerpt reveals similar themes:

One of the few senior women in the field of science. A mentor, colleague, collaborator and friend, plus a leader in [a biochemical subfield].

(Female chemist, female postdoctoral supervisor)

Women scholars particularly valued advisers and supervisors who were sensitive to issues facing women in the discipline or who went out of their way to support women students in environments that were not always welcoming to women. Others appreciated advisers with whom they could discuss issues of work and family balance. The following excerpts illustrate:

He did not question by ability. He didn't suggest that I quit--even when I had a baby in my second year of graduate school. It was quite unheard of for a women in the sciences to have children while in graduate school at the time [the early 1970s].

(Woman physicist, male doctoral adviser)

Male advisers' efforts to support women were appreciated, even when the support was limited. A woman sociologist, for example, listed as an advantage her male adviser's encouragement of her work about gender from a feminist perspective and of his defense of it to potentially-hostile other committee members, even though "....he didn't know anything at all about the topic I was studying, or,

for that matter, sociological research about women."

One female chemist listed as an advantage of her male doctoral adviser that he was "one of the few male chemists who would go to lunch with a female colleague."

A sociologist wrote of her adviser:

> She was amazingly honest about what it was in the profession, in the discipline, as a woman. She warned me that there would be choices I would have to make, and that they might be harder for me than for men. She knew that having a family was important to me. She was astonishingly frank about telling me things about her own life...her mistakes, her negative choices. She did that in an encouraging way.
>
> (Female sociologist, female doctoral adviser)

Although most common in male adviser/female protege combinations, such issues were not altogether absent from men's relationships with male advisers, as in the case of a male sociogist whose postdoctoral adviser told him he would never be a first-rate scholar because he shared child-rearing with his wife and occasionally brought his two preschool children to the office.

The importance of having some one to talk with about personal as well as professional life was underscored by the number of scholars who wrote or phoned to discuss the lack of opportunities to discuss such issues and the alienation they had felt as a result. Many women scholars, for example, seemed uncertain about how to discuss pregnancy and childbirth with mentors and colleagues and many had no contact with senior women scholars who had borne children. A woman chemist wrote an elaborate description of her plan to first acquire tenure, then marry, then attempt to have two children in rapid succession--the only pattern she believed was possible for professional survival. A woman sociologist wrote

of concealing an unexpected, but welcomed, pregnancy from her male adviser as long as possible for fear that he would withdraw her funding. Another sociologist conspired to keep the male adviser with whom she wanted to work from learning she was a single parent until he had signed papers to direct her dissertation. She previously had heard him disparage the commitment of women students with children.

Just as male and female advisers who were sensitive to specific needs of women in science were valued, those who were insensitive to these issues were criticized, as in the following descriptions:

> Had problems with my pregnancy and childbirth my last year. Tried not to rehire me. Wrote on a form for the department that he didn't want me ending up as a bad mother and a bad researcher by trying to do two things at once.
>
> (Female astrophycist, male adviser)
>
> * * *
>
> Hopeless sexism. Awkward with women. Incapable of collaborations with women.
>
> (Female physicist, male adviser)
>
> * * *
>
> Saw it as his duty to "save" biochemistry from women's influence. Constantly disparaged the abilities of women, individually and collectively, with colleagues and students.
>
> (Female biochemist, male adviser)

Some female respondents noted that the lack of departmental policies on issues such as pregnancy, family leave, allocation of credit, or sexual harassment complicated their negotiations with advisers because expectations were

unclear. The pathway was especially difficult for women who were "firsts": the first woman in their doctoral program, the first pregnant woman in the program, etc.

Ingoring and trivialization of work was another disadvantage mentioned occasionally by men of male advisers and supervisors but more commonly by women, as in the following excerpts:

> More attentive to the work done by the male postdocs. They went to the meetings more often. They got introduced around in the profession.
> (Female chemist, male adviser)

* * *

> He was much more interested in the research of the male students. He gave me little attention or guidance.
> (Female physicist, male adviser)

* * *

One female sociologist complained that her doctoral adviser appeared to forget the topic of her in-progress doctoral work when he introduced her to colleagues at a professional meeting.

Paternalism was another theme mentioned occasionally by men in relationships with male advisers and supervisors but more typically by women working with male mentors, as in the following comments:

> Turned down a postdoctoral position without my knowledge and consent because he believed the move would be a bad one for my husband (also his student).
> (Female physicist, male adviser)

* * *

> Wouldn't let go when it was time to move on. Tried to restrict my job search to [nearby locales], even though I made it clear to him that this was not my desire. Had a million excuses: big cities were "unsafe," the upper Midwest was "too cold," etc.
>
> (Female chemist, male adviser)

Women in all disciplines complained of advisers or postdoctoral supervisors who tried to steer their searches for jobs or postdoctoral appointments in directions they women did not want to go, such as toward teaching colleges only, women's colleges only, nonacademic jobs only, or government jobs only. Such unwelcomed paternalism seemed motivated by a number of factors, including a desire to keep the woman scholar nearby, greater concern about her husband's job prospects than hers (particularly prevalent when spouses shared an adviser), or well-meaning, but misguided, notions about what the women really wanted or what would be best for them.

From the perspective of women proteges, the greatest disadvantages occurred with the unwelcomed sexual dimensions in mentoring relationships. Sexual harassment was relatively infrequent (mentioned by less than 7 percent of respondents), but powerful and long-lasting in its consequences. All reports of actual or feared sexual harassment involved women proteges with male advisers: "He was something of a womanizer; This was well known"; "I always was wary of sexual advances"; "I think he fanned rumors (untrue) that we were lovers and this was very damaging to my relationships with other faculty and students" A woman sociologist wrote of the devastation to her career when a postdoctoral adviser, whom she had moved 3,000 miles to work with, withdrew her promised multi-year funding when she refused sexual involvement with him. This left her destitute and unemployed. Another womam sociologist believed that her career development had

been limited when the wife of her postdoctoral adviser objected to her traveling to professional meetings that he attended, and thus her travel funding was withdrawn. A woman physicist characterized the laboratory in which she did her postdoctoral work as "a sexual playground" in which she felt very uncomfortable.

Women who had experienced sexual harassment or a hostile work climate commented that they felt they had few resources to use in combatting the problem. They either endured the harassment (sometimes paying a price in diminished productivity) or left the site, often sacrificing years of work and risking negative recommendations in the process. In a classic study, Pelz and Andrews (1976) found that scientific productivity could be significantly predicted by the degree of support and comfort that scientists felt in their workplaces, net of the effects of factors such as ability and quality of training. If women feel more discomfort in the workplace than men, their productivity might be negatively affected.

Collaboration

Research suggests that collaborating with an adviser is beneficial for advantageous first-job placement and for productivity later in the career (Long 1990). It therefore is important to examine whether women have as much opportunity to collaborate with mentors as do men. Collaboration rates vary across disciplines and are more common in the physical and natural sciences than in social sciences and humanities. While nearly all chemists had collaborated with doctoral advisers, less than half of sociologists had collaborated with advisers on at least one publication, chapter, or grant proposal. Table 3 shows collaboration rates of women and men with advisers and postdoctoral scholars. Net of this systematic disciplinary variation, however,

women were slightly less likely to have collaborated with doctoral or

postdoctoral advisers (Table 3), though these differences approached statistical significance only for physicists and astronomers' collaborations with postdoctoral supervisors (p=.11). Followup questions, however, did reveal that in all disciplines except physics and astronomy, men's collaborations with advisers tended to be more elaborate than did women's, involving several papers, grants, or projects. At the postdoctoral level extent of collaboration was not significantly different for women or men in any discipline.

Only in sociology were there sufficient numbers of scholars who had had female doctoral advisers to explore whether the gender composition of the mentoring dyad affected collaboration rates. Among sociologists, the highest collaboration rates were in dyads composed of women scholars and women mentors (56%), followed by male mentor/male student dyads (38%), male mentor/female student dyads (33%), and female mentor/male student groups (0%). Thus, there was some suggestion that women collaborated more and that same-gender dyads had higher collaboration rates than mixed-gender ones, though most of these differences were small and only for the latter group was it statistically significant. There were only four cases in this category.

In all fields except chemistry, where collaboration is overwhelmingly the normative form of research productivity, women showed significantly higher collaboration rates than men. In each discipline a larger proportion of women's publications (articles, books, book chapters, conference papers, and research grants) were collaborative in comparison with men in their respective discipline. This confirms earlier studies that have suggested that women collaborate more than men (Mackie 1985; Ward and Grant 1991). In chemistry and physics, where collaboration is frequent, this likely produces no disadvantages for women. There may be disadvantages in sociology, however, where 34 percent of women respondents

and 24 percent of the men believed that collaborative work was judged less favorably than solo-authored pieces. The form in which women produce research might create disadvantages for them in the evluation of the merit of their work when decisions about hiring, tenure, promotion, and salary are made.

Dynamics of Collaborative Work

Much research in the social, natural, and physical sciences is produced in research teams. This model is especially prevalent in chemistry and physics, where scholars in training work in laboratory groups made up of multiple members, but some sociologists also report training in such a context (Ward, in progress). Prior research has suggested that research teams may produce gendered divisions of labor (Reskin 1978; Rossiter 1982; Zuckerman et al. 1991). Women might be assigned less challenging, female-stereotyped tasks such as library research, writing, or routine clerical tasks while men more often design or perform experiments, conduct statistical analyses and present the work of the team in public. Further, some writers contend that junior scholars and women scholars may be undercredited more often than others for their contributions to collaboratively-produced research.

Questionnaires asked women and men scholars about the dynamics of collaborative work that they had carried out four years previously. The four-year period was chosen to maximize the likelihood that the work had progressed sufficiently to develop a stable division of labor but was recent enough that the respondent could recall accurately the allocation of tasks. Respondents were asked to assess their contributions to collaborative work and to judge whether, in their opinions, they had been assigned much more, more, less, much less, or about as much credit as they deserved for collaborative work.

Sociologists were asked how much they, in comparison with coauthors of collaborative work, had suggested the idea for the paper or publication, secured funding for the research, conducted the literature review, created the research design, collected the data, drafted the paper, wrote the final paper, decided about conference presentation, decided about journal submission, handled correspondence related to publication, or carried out revisions. Chemists and physicists were also asked about their contributions to preparing materials and equipment for experiments and carrying out experiments (see items 38 on respective questionnaires).

Analyses revealed few significant gender differences in tasks performed in research teams. In all disciplines except sociology, males were significantly more likely to have secured research funding for the project. In physics, men were marginally significantly more likely than women to have handled correspondence with journal editors ($p=.07$). In chemistry, there was a tendency for women to have contributed more than had coauthors to the literature review ($p=.11$). Otherwise, women and men were equally likely to have performed each of these tasks in collaborative work. Also, there were no significant differences by gender or discipline in assessments of whether or not one had been fairly compensated for contributions to collaborative work, where the modal response across all these groups was that one had received "about as much credit as I deserved" for contributions to collaborative work.

Other Mentors

Women were more likely than men to say they had mentors other than doctoral and postdoctoral advisers, and they also had significantly more other mentors in comparison with men in their disciplines. Overall for all disciplines, women reported 1.86 additional mentors, compared with men's .72.

White males' other mentors most typically were other senior scholars in their disciplines, for example, other members of doctoral committees or research teams. Women and minority male scientists also listed such persons most frequently as other mentors. However, these latter scientists were more likely to include more diverse individuals as mentors, including peers, classmates, faculty outside their disciplines or universities, or persons outside of academia altogether.

One woman sociologist, for example, listed as mentors two junior faculty in other social science departments (one of whom was on her doctoral committee). She had sought them out for assistance in doing feminist research when her adviser, though supportive of her project, proved to be unknowledgeable about her topic and the methods she proposed to use. Some women scholars had used "hidden mentors," working formally with a senior scholar (usually male), but in reality relying most heavily on another faculty member (usually more junior, often female). Sometimes this solution had been suggested by a junior faculty member. This was a risky strategy for both parties, however, requiring maniuplation and risk of becoming embroiled in departmental politics on the part of the protege and lack of reward or recognition for mentoring activities on the part of the hidden mentor.

Some women reported that junior women scholars had suggested that the protege pursue such a strategy, however.

Outside and nonacademic persons also were named as mentors. A minority male biochemist relied heavily on a faculty mentor from another university, since no one in his local institution knew much of the minority health issues he wanted to research. Other scholars listed friends or kin who had facilitated their careers in some way as "mentors." A woman biochemist credited her mother, a high school English teacher, for "...Setting a fine example of persistence and quality

work. Never giving up. She believed in me through the rough spots when nobody else did." A minority woman chemist credited a non-relative teacher in humanities with supporting her scientific career by "....being the first person to believe that I had a fine mind and that I could do a lot with it." Similarly, a minority male chemist listed as a "mentor" distant relatives who had offered to mortgage their home to permit him to continue his undergraduate work and qualify for a graduate fellowship when his immediate family faced severe financial problems. "Mentor" appeared to have a different meaning for subgroups in the sample, with women and minorities including persons who had helped their academic progress in multiple ways, whether or not they were in formal mentoring roles within academic institutions. White men, on the other hand, tended to regard only senior scholars in academia, usually their own departments, as their mentors.

Women and minority scholars also pointed to the importance of professional organizations, special conferences, off-campus mentoring programs, and publications aimed at women and minority scientists as important "mentors" for them in otherwise hostile environments. One sociologist identified as an important mentor "....the local and national chapters of SWS [Sociologists for Women in Society]. That's where I found people to talk through ideas, critique work, cheer me up when I needed it. Filling out this questionnaire made me realize how important that group had been to my survival." Another woman sociologist made similar comments about the Curriculum Integration Workshop at Memphis State University, a program that operated in the late 1980s to prepare scholars for teaching nonsexist, multicultural curricula. A woman chemist said an informal women in science brunch group had been more important than to her than doctoral committee members in helping her think through her dissertation project. A woman astrophyscist described publications and activities of the

committee on the Status of Women in Physics as "My lifeline. Sustaining my vision of another, more reasonable, world." Women scholars in all disciplines noted the importance of various special conferences or publications in journals in their disciplines that had exposed them to female role models and/or work by women not previously encountered in their studies.

These findings raise a number of issues. On the one hand, women clearly were benefitted by the availability of mentors beyond their local departments. Many were flexible and creative in finding sources of support and mentoring when this was not provided in their local departments. The ties they formed might benefit them in the future and, on a larger level, might help to create productive cross-disciplinary, cross-institutional ties. On the other hand, the fact that women, and minority male scholars, needed to search so hard for mentors suggests that their mentoring needs are not being met in many departments. Although the search for alternative mentors often produced beneficial relationships, women had to expend time and energy that men did not establish such relationships. Furthermore, the relationship might be detrimental to the external mentor who, if an academic, likely gets little credit for her or his contributions.

Consequences of Mentoring Experience

The research was designed not only to explore the quality of mentoring that women and men scientists had encountered but also to assess the impact of mentoring experiences on their productivity. To explore these questions a series of ordinary least squares regressions were performed, using as dependent variables three key measures of research productivity: total numbers of articles published; total books published; and total funded research grant proposals. Because normative patterns of productivity differ across discipline and because

there were variable response rates by discipline, separate regressions were performed for sociologists, chemists, and physicists. Used as predictors in these equations were gender (coded 1=female, 0=male), effectiveness of doctoral adviser (coded on a scale of 1-4, with high ratings denoting greater effectiveness) and a dummy variable indicating whether the scholar had ever collaborated with her or his adviser (coded 1=yes, 0=no).

A second set of equations explored the impact if effectuveness of postdoctoral supervisor and collaboration with postdoctoral supervisor for scholars in each discipline who had held postdoctoral posts. These equations were based on experiences with the first postdoctoral adviser.

Analyses included a number of controls. Degree year, a measure of professional age, is expected to be related to productivity. Degree year was coded as the last two digits of the year in which the Ph.D. was awarded (e.g., 1968 was coded as 68). A negative relationship between productivity and degree year is expected. Controls were introduced for marital status (1=ever married; 0=never married) and parental status (1=one or more natural, adopted or stepchildren who were living with the respondent or who had lived with the respondent while growing up, 0=no children), since disagreement exists among researchers about whether these statuses affect productivity (Cole and Zuckerman 1987, Zuckerman 1988). Only cases with complete data on all relevant variables are included in the analyses.

Effects on Productivity: Doctoral Mentoring

Table 4 reports results of an equation exploring the impact for women and men of effectiveness ratings of doctoral adviser and collaboration with the adviser on production of journal articles over one's career. Professional age is

controlled, as are marital and parental status. The table reports unstandardized regression coefficients for equations estimated separately by discipline.

Table 4 reveals that there are no significant differences in numbers of journal articles published, an important measure of productivity in all disciplines, net of the effects of other variables. Women and men were equally productive. As expected, in all disciplines year of degree exerts a significant influence on articles published, with scholars with earlier degrees reporting more published articles.

The table also shows no significant effects of the effectiveness rating of adviser or collaboration with adviser on journal article publication, however. Notably, with one exception (collaboration with advisers by chemists) the signs of these coefficients are positive, indicating a trend toward effective advising and collaboration enhancing journal article publication.
Marital and parental status have no significant effects, and the signs of these coefficients differ across disciplines.

Table 5 presents a similar analysis, this time with total funded grants as the dependent variable. The results are very similar to those obtained in the previous analysis. No gender differences appear in numbers of funded grants, when controlling for professional age. Year of degree is significantly and negatively related to funded grants. Effectiveness of adviser or collaboration with adviser has no impact on receipt of grants, although the coefficient for chemists nearly reaches significance (p=.059). However, this coefficient is negative, indicating that chemists who collaborated with doctoral advisers had less research funding later on, a pattern that is difficult to interpret. Marital status has no significant impact, although all coefficients are positive indicating a trend

toward more funding for married scholars. Parental status also is insignificant, with the sign of the coefficient varying across disciplines.

Thus, despite the fact that women reported slightly less effective mentoring than men, they were not disadvantaged in productivity over the long run. It should be recalled that the majority of these successful scientists, both women and men, had had good relationships with mentors, and this perhaps gave them a start on productive careers. It also is possible quality of mentoring had little impact on long-range productivity, with the influence limited to the period when the scholar works directly with the mentor.

In analyses not reported here, the effects of these variables on two other forms of productivity--book publication and conference papers--was explored. Results were very similar to those for journal publication and funded grants, except that for sociologists book production was unrelated to degree year but positively related to collaboration with doctoral adviser. Book publication likely has a different meaning in sociology in comparison to other disciplines. When chemists and physicists and astronomers published books they usually were textbooks, which tend to bring less credit than journal articles and conference papers in evaluations of performance. In sociology, however, a larger proportion of books are apt to be research monographs which can bring scholars substantial rewards.

Effects on Productivity: Postdoctoral Mentoring

Table 6 reports results of analyses testing the impact of effectiveness of first postdoctoral adviser and collaboration with first postdoctoral adviser on journals articles published. Once again, there are no gender differences, net of other factors, in articles published by sociologists or physicists, but female chemists who had completed postdoctoral posts published somewhat less than male

counterparts. This finding suggests that within this discipline, postdoctoral posts were more advantageous for men than women in terms of longer-range productivity payoffs. Effectiveness rating of postdoctoral adviser was not significant, though signs of coefficients in all disciplines were positive. Collaboration with postdoctoral supervisor also had no significant impact and signs of these coefficients were negative for sociologists and chemists. Neither marital nor parental status had predictive value for scholars in any discipline.

For sociologists, professional age was not significant, though this factor did affect productivity of scholars in the other two disciplines. Analyses for sociologists are based on a much smaller case base than is true for other disciplines, since the majority of sociologists do not take postdoctoral positions. The meaning of a postdoctoral position in sociology also is more ambiguous than is the case for other disciplines where at least one postdoctoral position is a normal, expected component of one's training. In sociology, some scholars might have taken postdoctoral posts for specialized advanced training, but many took these positions when they could not find regular tenure-track jobs. Marital and parental status again have no significant or consistent effects on publication of journal articles.

Table 7 examines the impact of the same set of predictors on total grants funded. Gender does not affect grants funded for sociologists and physicists and astronomers who held postdoctoral posts, but female chemists in this group had received significantly fewer grants than male counterparts.

Effectiveness of rating of one's postdoctoral supervisor is a significant predictor of funded grants for sociologists, but collaboration with postdoctoral advisers significantly <u>decreased</u> funded grants, net of other factors. It is possible that scholars who collaborated with postdoctoral

supervisors received extended support from the supervisor's grant or grants, diminishing the need to apply for one's own funding. In the other disciplines, neither of these variables had a significant impact on funded grants, which also were unaffected by marital and parental status. Professional age affected chemists' and physicists' and astronomers' funding records, but not those of sociologists.

Implications

Overall, these analyses show few impacts of effectiveness of mentoring by doctoral or postdoctoral advisers, or collaboration with these mentors, on productivity, when productivity is measured over the career. Analyses are being performed to explore whether there might be shorter-term effects (within five years of completion of degree or postdoctoral assignment).

The optimistic implications of the findings are that women and men appear to do equally well in terms of productivity over the career cycle, when professional age is controlled. Marriage and children do not appear to disadvantage women scholars in productivity, consistent with findings of some earlier studies. Although women have slightly less effective relationships with mentors, collaborate with them, and work less with eminent mentors in some disciplines, these factors do not appear to handicap them in long-term productivity. Women appear overall to have received mentoring of sufficiently good quality, or perhaps to have found additional mentors, to learn what they needed to achieve success in publication and funding later on. It is also possible that women overcame disadvantages at early points in their careers. Another possibility is that quality of mentoring might be less directly related to career success than it has been portrayed as being.

Several cautions should be raised, however. First, this sample included only successful scientists. Scientists with poor mentoring experiences might have been more likely than others to fail to complete their degrees or to obtain jobs in Ph.D.-granting departments in their disciplines. They therefore might not be represented in this sample. Responses to open-ended questions suggest that even among these successful scientists, women were more likely than men to encounter problems in mentoring relationships. Perhaps not all women students have been able to overcome these problems as effectively as have women in this sample. Interview data collected in Ward's related study suggest that lack of access to mentoring is still a persistent problem for women and minority scientists, even when these individuals ultimately succeed.

Many report friends and colleagues who did not persist (see also Keller 1977).

If women are over-represented among this group, mentoring might be a source of disadvantage for women. A similar pattern might occur for women who have children. Long (1987) has suggested that the most seriously overburdened women scientists who are mothers might drop out of science or academia or occupy off-tenure track positions and hence not be represented in the samples where effects of parental status and gender on persistence and productivity are tested. Personal accounts by women scientists (see, e.g., those in Zuckerman et al. 1991), and reports by women scientists in this sample of their own and others' skepticism about their abilities to handle roles as parents and scientists simultaneously, suggest a need for further exploration of this issue. Effects of parental status also may be of short-range, limiting productivity when children are young but evening out over the life time. Questionnaires, and Ward's parallel interviews, suggest that women scientists who are parents have, for the most part, planned child-rearing very carefully. Some also report making compromises

in their plans, such as bearing fewer children or having children later in their careers than they deem ideal.

The involvement of women as mentors of junior scientists also deserves further study. Only in sociology had a sufficient number of scholars had female mentors to allow exploration of effects of gender of adviser on mentoring processes and outcomes. Findings for this group suggest that women mentored by women found these relationships to be very effective and productive. There is some evidence in other disciplines that women scholars are mentoring larger proportions of women and minority students and postdoctoral associates, in comparison with male colleagues. The sociology findings suggest that this might have a positive impact on entry and progress of underrepresented groups in science.

These are issues that require further study. They also are issues that would be best addressed with a prospective research design, following over time a cohort of women and men scientists from beginning of their education through establishment of their careers. The points of greatest vulnerability for loss of women to academic careers in science might come at earlier points in training than those explored in this study.

Implications for Educational Policy

The findings of this study suggest that although mentoring experiences affecting women scientists are not wholly negative, some improvements can be made. The comments to open-ended questions, more so than the quantitative data, pinpoint particular trouble spots.

First, findings suggest programs designed to bring more women into science are sound strategies for increasing participation for under-represented groups. Women valued access to role models of similar status attributes, and those who do well in science often are those who have searched hard to find such models beyond their local institutions. Women also were benefitted by professional organizations, publications, and special conferences directed toward the needs of women in science. Funding for such programs should continue. Furthermore, educational institutions should make special efforts to bring women scientists in training into contact with women scientists through allocations of travel funds, visiting scholar programs, and the like. They should encourage, and reward, senior women scholars for taking part in programs stretching beyond their own campuses that provide mentors and role models to students and more-junior scholars. Dollars spent on these programs appear to have important payoffs.

Second, academic institutions should be attentive to the gender-specific problems that women sometimes face in regard to mentoring, particularly when they work with male scholars, and take steps to eliminate these subtle, but powerful, barriers for women. These include ignoring or trivializing of women's work, paternalism, sexual harassment, and outright refusal to work with women scholars. Strong policies supportive of gender equity, in combination with equally strong enforcement, can be helpful in this regard.

Women students must have access to effective mechanisms for combatting sexual

harassment without risking their careers. It is the job of educational administrators to provide women with conmfortable learning and working climates free of threats of harassment.

Third, universities should become sensitive to special needs of women in combining work and family, with regard to both students and faculty. Particularly in the natural and physical sciences, women are less well represented in academia than in the private sector or government posts. One reason is that private-sector employers and government agencies
are well ahead of many universities in providing supports for workers that are particularly attractive to women, such as maternity leave, safe workplaces, and on-site day care. Universities are the primary training grounds for the next generation of scientists. If women are underrepresented in universities, relative to other posts in science, their ability to mentor future scientists also is diminished.

Fourth, universities might not provide all the support that they can for mentoring. Mentoring, especially of women and underrepresented groups, is not highly rewarded in reviews for hiring, promotion. tenure, and salary. Therefore, scholars are not encouraged to allocate time and effort to this activity. Scholars also receive little training for their role as mentors.
Ward's interviews, in particular, suggest that one's own experience as a mentor affects willingness to enter that role as a senior scholar. Scholars who were well mentored often are comfortable as mentors and take on that role early in their careers. Scholars who were less well mentored take on this role more reluctantly and, often, later in their careers.

In addition to providing reward and recognition for scholars who mentor well, universities might also involve these successful mentors in programs to aid

other senior scholars in developing mentoring skills. This might be particularly important in disciplines such as physics and astronomy, where examination of gender and race characteristics of scholars now in the pipeline make clear that most of the mentors of the next professional generation will continue to be white males. Senior scholars who have been particularly effective mentors of underrepresented groups should be encouraged to share their skills with others, through programs sponsored by universities and/or professional organizations.

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Table 1. Number of Respondents and Response Rates by Discipline and Gender.

	Female N (%)	Male N (%)	Total N (%)
Sociology	142 (71%)	87 (44%)	229 (57%)
Chemistry	97 (49%)	74 (37%)	166 (42%)
Physics	115 (58%)	72 (36%)	187 (47%)

Table 2. Ratings of Effectiveness of Doctoral and Postdoctoral Advisers by Discipline and by Gender

	Female (N)	Male (N)
Doctoral Adviser		
Sociology	3.01	3.00
Chemistry	3.06	3.30
Physics	2.67*	3.07*
First Postdoctoral Adviser		
Sociology	2.45	2.20
Chemistry	3.54*	3.18*
Physics	2.80	2.77

* Denotes significant gender difference at $p<.05$.

Table 3. Rates of Collaboration with Doctoral and Postdoctoral Adviser, by Discipline and Gender.

	Female	Male
Collaborated with Adviser		
Sociology	39.8%	41.5%
Chemistry	91.7%	96.7%
Physics	81.2%	82.4%
Collaborated with Postdoctoral Adviser		
Sociology	38.1%	50.0%
Chemistry	91.5%	96.1%
Physics	65.9%	79.7%

* Denotes significant at $p<.05$

Table 4. Impact of Effectiveness of Doctoral Adviser, Collaboration with Adviser, Gender and Marital and Parental Status on Total Articles Published for Scholars in Three Disciplines, with Professional Age Controlled. (Unstandardized Ordinary Least Squares Regression Coefficients)

	Sociologists	Chemists	Physicists
Intercept	71.08***	282.61***	154.04***
Gender	-3.72	-9.42	5.11
Effectiveness of Adviser	1.69	5.42	2.95
Collaboration with Adviser	1.98	-4.40	7.79
Married	5.27	-4.23	14.98
Children	-2.89	1.95	-1.99
Year of Degree	-.80***	-3.18***	-2.00***
R-square	.18	.19	.26
(N)		(141)	

*** Statistically significant at p<.001
** Statistically significant at p<.01
* Statistically significant at p<.05

Table 5. Impact of Effectiveness of Doctoral Adviser, Collaboration with Adviser, Gender and Marital and Parental Status on Total Research Grants Funded for Scholars in Three Disciplines, with Professional Age Controlled. (Unstandardized Ordinary Least Squares Regression Coefficients)

	Sociologists	Chemists	Physicists
Intercept	11.29***	30.57***	24.58***
Gender	1.42	-3.40	.41
Effectiveness of Adviser	.05	-1.58 (p=.059)	.81
Collaboration with Adviser	.31	3.40	1.75
Married	1.35	.20	1.78
Children	.26	-.38	.18
Year of Degree	-.13	3.40***	
R-square	.04	.09	.14

*** Statistically significant at p<.001
** Statistically significant at p<.01
* Statistically significant at p<.05

Table 6. Impact of Effectiveness of Postdoctoral Supervisor, Collaboration with Postdoctoral Supervisor, Gender and Marital and Parental Status on Total Articles Published for Scholars in Three Disciplines, with Professional Age Controlled. (Unstandardized Ordinary Least Squares Regression Coefficients)

	Sociologists	Chemists	Physicists
Intercept	3.65***	316.80***	171.34***
Gender	2.15	-21.96*	3.10
Effectiveness of Postdoctoral Supervisor	3.65	6.24	1.21
Collaboration with Postdoctoral Supervisor	-2.01	-15.80	.40
Married	-.39	-8.53	8.15
Children	6.09	1.95	11.42
Year of Degree	-.48 (ns)	3.39***	1.94***
R-square	.05	.33	.33

*** Statistically significant at p<.001
** Statistically significant at p<.01
* Statistically significant at p<.05

Table 7. Impact of Effectiveness of Postdoctoral Supervisor, Collaboration with Postdoctoral Supervisor, Gender and Marital and Parental Status on Total Research Grants Funded for Scholars in Three Disciplines, with Professional Age Controlled. (Unstandardized Ordinary Least Squares Regression Coefficients)

	Sociologists	Chemists	Physicists
Intercept	2.89	34.93***	20.42***
Gender	1.81	-2.94**	.09
Effectiveness of Postdoctoral Supervisor	3.19**	.08	.35
Collaboration with Postdoctoral Supervisor	-5.61*	.43	1.92
Married	2.10	.20	2.01
Children	3.77	-.38	1.37
Year of Degree	.10	.37***	.25***
R-square	.05	.19	.15

*** Statistically significant at p<.001
** Statistically significant at p<.01
* Statistically significant at p<.05